

Cross-Cutting Initiatives and Programs

NREL carries out research, development and deployment tasks for EE's Office of Budgeting, Planning, and Customer Service and Office of Federal Energy management. NREL also carries out research, development, and deployment tasks that cross-cut all four major EE sector offices (Utilities, Transportation, Buildings, and Industry). These cross-cutting tasks include a new initiative in biomass conversion, and ongoing programs in the areas of Federal Energy Management, Analysis, and Technical Communications Services. Plans for these cross-cutting programs are outlined here.

In addition, NREL's work in resource assessment also supports more than one sector office. Because most of the resource assessment funding has come from the Office of Utility Technologies, NREL's resource assessment work is reported in that section, on page 1-19.

Initiative: National Biomass Conversion Center

Using biomass to generate electricity, replace fossil fuels in transportation, and reduce the energy required to manufacture chemicals through biobased feedstocks or components will help the United States and the world reduce environmental degradation, improve energy security for many nations, and strengthen local economies. For instance, the biomass power industry in the United States created 66,000 jobs, and the industry is valued at \$15 billion, according to U.S. Department of Commerce statistics.

Using biomass to generate electricity, replace fossil fuels in transportation, and reduce the energy required to manufacture chemicals through biobased feedstocks or components will help the United States and the world...

In the United States, biomass resources today are primarily waste products from the food and feed production (agriculture) industries, industrial wastes from wood products and fiber manufacture, and municipal wastes. Current processes for using biomass to generate electricity or produce fuels and chemicals are not integrated or very efficient.

In support of this initiative, NREL intends to foster the global development of biomass as an effective renewable resource, teaming with industry and other laboratories.

For example, electricity production from agriculture residues is only 20% efficient; the process could become 50% efficient or more with improved technologies that NREL is helping the private sector develop.

The need and opportunity for improved biomass processes is even greater in developing nations, where biomass is already a vitally important energy source and produces 32% of primary energy, compared to 3% in industrial nations.

National Biomass Conversion Center

The goal of the proposed National Biomass Conversion Center is to foster the global, integrated development of biomass as an effective resource for producing electricity, chemicals, and fuels. An example is shown here of the kind of collaboration between a national laboratory and an industry research group that can help in commercial-scale production of one biomass product, electricity.

NREL's transportable molecular beam mass spectrometer (above) is helping the Institute of Gas Technology to optimize its processes being used in the 10 ton/day Renugas biomass gasifier in Chicago (shown in photo at right). (Photo - NREL)

The 10 ton/day Renugas biomass gasifier at the Institute of Gas Technology.

This 100 ton/day biomass gasifier in Hawaii is a scale-up of the Renugas facility in Chicago (see photos above). It uses bagasse (sugar cane residue) from the nearby sugar extraction mill to produce electricity, but conversion efficiencies can be much improved with advanced technology. (Photo - Warren Gretz, NREL)

The energy initiatives sponsored by DOE, the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, and the White House Office of Science and Technology Policy.

In support of this initiative, NREL intends to foster the global development of biomass as an effective renewable resource, teaming with other laboratories and industry. NREL performs world-class research on the efficient and cost-effective conversion of biomass resources to useful products and energy, including ethanol for fuel, biodiesel, hydrogen, electricity, chemicals, and new biobased materials. NREL is the only laboratory in the United States where biomass conversion to fuels, chemicals, and electricity can be developed in an integrated manner. NREL has extensive expertise in biological, thermal, and chemical conversion of biomass, along with process and systems analysis capabilities.

NREL has unique facilities that enable technology development from laboratory scale up to the 1-ton/day pilot-plant level. Such a breadth of facilities and capabilities, and the ability to integrate technology development for all uses of biomass, exists only outside the United States.

NREL has unique facilities that enable technology development from laboratory scale up to the 1-ton/day pilot-plant level. Such a breadth of facilities and capabilities, and the ability to integrate technology development for all uses of biomass, exists only outside the United States, where governments such as Finland and Canada have been funding integrated development of biomass in a sustained way.

NREL will work with industry, and other laboratories where isolated special expertise in biomass technology development exists, to reduce the development time and speed commercialization of successfully integrated concepts.

The primary goal of the Center is to leverage NREL's current activities and facilities with those of industry to speed the development and commercialization of successful concepts. NREL will establish the National Biomass Conversion Center to fully utilize its world-class research capabilities to fill the need for cooperation and coordination of biomass development and applications among DOE and other agency laboratories. NREL's acclaimed scientific expertise in biomass conversion will remain the heart of the new Center, while strategic partnerships and alliances will be central to the operation of the Center. These allies will include state and local organizations seeking to use biomass resources, as well as other key stakeholders.

Federal Energy Management

The U.S. government has an enormous cost-savings opportunity as the largest energy user in the world. In 1994, the government spent \$8 billion for its 500,000 buildings, its vehicles, and process energy. The DOE Federal Energy Management Program (FEMP) reduces the cost of government

and makes it work better through energy efficiency, use of renewable energy, and water conservation.

FEMP leads the federal energy efficiency efforts and helps federal energy managers identify and procure the best, most cost-effective energy-saving projects. It does this through proactive problem solving; an aggressive emphasis on increasing the number and quality of projects and effective partnerships among agencies, utilities, the private sector, and states. Partnerships lead to increased motivation and education and reduced barriers to successful procurement.

FEMP leads efforts to increase energy, environmental, and economic resource efficiency in the federal government. The "greening" of the Presidio in San Francisco demonstrates innovative technologies and financial strategies for energy efficiency and environmental sustainability. (Photo - Golden Gate National Park Association)

As the lead organization implementing legislation and presidential direction for federal energy efficiency, FEMP administers an interagency energy committee and task force and collaborates with the DOE national energy laboratories. FEMP works with energy service companies, energy savings product manufacturers, and utilities. This partnership will lead to a \$1 billion investment by companies willing to invest in return for a share of the energy cost savings. With FEMP project financing, audits, training, technical assistance, and new technology demonstrations, agencies overcome obstacles to achieving widespread energy efficiency.

The benefits of FEMP accomplishments are considerable. The efforts of FEMP have already helped reduce federal energy costs by more than \$3 billion from 1985 levels during the past 2 years. By 2000, taxpayers should save \$400 million annually from energy efficiency improvements; also, \$4 in net savings is leveraged for every \$1 invested.

FEMP works in four major activity areas: project financing; technical assistance; coordination, reporting, and awareness; and new initiatives. FEMP pursues two project-financing mechanisms to

The efforts of FEMP have reduced federal energy costs by more than \$3 billion from 1985 levels during the past 2 years.

leverage existing federal funds and private-sector resources to finance energy- and water-saving projects. Using energy savings performance contracting, federal agencies contract with an energy service company that pays all up-front costs. In exchange the

company shares the cost savings resulting from the energy improvements. Private companies will invest more than \$2 billion in these financing contracts through 2005.

FEMP also provides technical assistance by helping agencies identify the best, most cost-effective energy efficiency, water-saving, and renewable energy projects through training, on-site audits, design assistance, and new technology applications. In many federal applications—such as irrigation, water heating, indoor and outdoor lighting, or communications—commercially available renewable technologies are often the most cost-effective option for supplying the needed energy, and they are environmentally friendly.

FEMP helps federal agencies take advantage of the benefits offered by renewable technologies and apply the renewable energy provisions of recent legislation. FEMP's Renewable Energy Program educates federal agencies about renewable energy opportunities and helps agencies implement successful renewable energy projects.

One of FEMP's primary responsibilities is to coordinate and report to Congress on interagency activities that achieve federal energy management goals. FEMP serves as the lead agency for coordinating the activities of two interagency committees to address policy and technical issues associated with federal energy management, collects and reports data on energy use in federal agencies, and disperses information

FEMP helps federal agencies take advantage of the benefits offered by renewable technologies and apply the renewable energy provisions of recent legislation.

among federal facility managers to help them make the best decisions on energy savings opportunities.

These thermosiphon solar water heaters, on the roofs of employee housing at Yosemite National Park, were purchased through an energy savings performance contract, an alternative financing approach that saves both federal dollars and energy. (Photo - Jim Schwerm, Solahart America)

NREL carries out activities that are essential for attaining the mandated FEMP goals for federal energy savings. These activities include implementing energy savings performance contracts that will leverage as much as \$40 million/year in private-sector alternative financing, implementing three renewable energy projects, supporting a major water conservation demonstration project, providing technology demonstrations, identifying agency projects, providing direct assistance to projects, and

training federal energy and facility managers.

To greatly streamline the procurement process for energy savings performance contracts (ESPCs), FEMP is developing several "super" contracts. These are indefinite-quantity contracts containing all the terms and conditions under which all federal agencies can order energy efficiency and renewable energy services as "delivery orders."

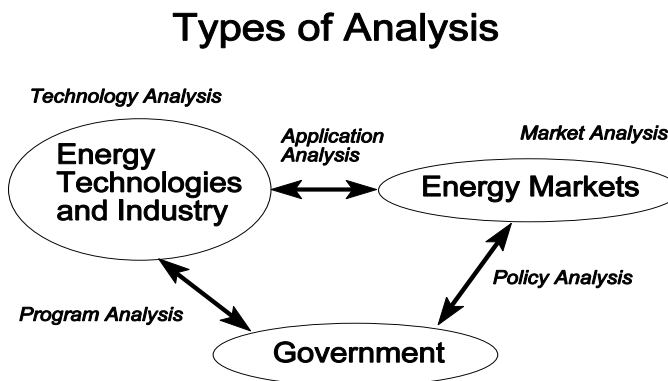
These contracts will be awarded on a regional or technology-specific basis for all federally owned buildings. Federal agencies will be able to implement their energy conservation projects by issuing orders from existing contracts, precluding the need to prepare new and separate contracts for each project. Each facility manager can focus on the technical issues required of a delivery order without becoming an expert on energy savings performance contracts. FEMP has the goal of establishing super ESPCs through all regional DOE offices by 1998.

Analysis

The purpose of NREL's analysis program is to provide the necessary information and insights into energy technologies, energy applications, energy markets, and program options . . .

program is to provide the necessary information and insights into energy technologies, energy applications, energy markets, and program options to support development and conduct of such effective research, development, and demonstration programs.

The primary entities relevant to the development and commercial use of energy efficiency technologies and renewable energy technologies can be grouped into three broad categories: the energy technologies and their developers, energy markets, and governments. The adjacent figure displays and describes the role of analysis with respect to these three entities.



NREL's analysis program will continue to include activities in all of these areas: technology and applications analyses, market analysis, and policy and program analyses.

Technology analyses are necessary to understand the technical (performance and reliability), economic (cost, both initial and operating), environmental (atmospheric emissions), and societal (social acceptance and impacts) characteristics that are essential to understanding the value and viability of these technologies in energy markets. Applications analyses address energy systems design and performance questions in the context of specific energy applications.

Market analyses are necessary to understand "who buys what from whom, for how much, and why" in both the present and the future. A particular emphasis in the immediate future is on understanding the evolving electric utility markets as these are being restructured to increase market competition. Policy analysis helps to reveal the impacts of various government policies such as taxes, regulations, and subsidies on the adoption of technologies. Finally, program analyses help us and DOE understand the benefits and costs of specific approaches to energy efficiency and renewable energy programs.

In addition to developing analytic information for NREL and DOE planning, the analysis program provides critical information for a variety of other purposes. For example, the Energy Information Administration relies on NREL for key information and projections for renewable energy systems.

The analysis program also includes a proactive market support function. NREL disseminates the results of its analyses widely, and regularly provides direct assistance to a variety of organizations interested in expanding the role of renewables, including energy system developers, state energy offices, utility commissions, and various citizens' groups. An example of these market support functions is NREL's participation in Green Pricing workshops held jointly with the Electric Power Research Institute and the Edison Electric Institute.

Technical Communications Services

The development and dissemination of technical information is a critical part of the successful transfer of technology from the DOE laboratories to technology users. To support national energy goals, EE strategic plan encourages information dissemination to promote the increased use of renewable energy and energy efficiency technologies. Development and dissemination of technical information and services accelerate the process of transferring technology to private industry and commerce.

NREL develops and distributes information to support the DOE/EE commitment to successfully transfer technology from the DOE laboratories to technology users.

NREL develops and distributes technical information products and services that promote the adoption of these technologies by the scientific, educational, business, and industrial communities as well as state and local governments. NREL provides technical information by different means to various audiences.

NREL, through the Information Services and Technical Information Programs, currently serves clients in all major offices of DOE/EE. These two programs work together to reach important target audiences, such as educators, local governments, and small businesses, as well as technology-specific groups such as trade associations.

Two key EE customer service functions managed by the Information Services Program are the Energy Efficiency and Renewable Energy Clearinghouse and Energy Efficiency and Renewable Energy Network. These services provide technology transfer information via phone hotline and the Internet to many customers, from students to inventors. The services also function as a feedback mechanism to DOE about the interests and information needs of its customer base.

The Technical Information Program provides communications planning services, produces a range of communications products (from documents and exhibits to videos and CD-ROMs) that target specific audience groups, and develops database information and retrieval systems. All of these activities support the DOE/EE commitment to successfully transfer technology from the DOE laboratories to technology users.